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APPLICATION  
FOR  
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**TITLE:** MOBILE COMMUNICATION SYSTEM FOR  
CONTROLLING SETTING UP A CONNECTION

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Description

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Method and mobile communication system for controlling the setting-up of a connection

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The invention relates to a method and a mobile communication system for controlling the setting-up of a connection.

Mobile subscribers are able to move freely with 10 their mobile stations even beyond the network boundaries of their home mobile radio network (roaming). However, when a subscriber is roaming into another visited mobile radio network, he cannot easily use call numbers well known to him from his home mobile 15 radio network such as, for example, service numbers, hotline number, mailbox number, etc. since he is subject to the numbering plan applicable in that network. Even if, in principle, it is possible to reach the call number in the other network, the mobile 20 subscriber usually dials the call number known to him from his network in order to initiate the call. However, this procedure is unsuccessful so the mobile subscriber must take elaborate additional measures.

It is known that mobile communication systems 25 use one or more subscriber databases (home location registers), in which the subscriber data are in each case stored for each subscriber for registering the mobile subscribers in their home mobile radio network. Since the subscriber is moving between a number of 30 radio coverage areas in the system, he is, in consequence, registered in one or more corresponding subscriber databases (visited location registers) with the subscriber-oriented data depending on his current location. It is known that an updating procedure 35 (location update) is performed for this purpose. These subscriber databases are coupled to mobile switching centers distributed over the system, which are

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responsible for controlling the setting-up of a connection and for routing the connections from/to the mobile stations which

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are in each case located in their area of responsibility because of their current location.

It is known from SMITH, D.G. "An introduction to GSM enhancements for operator specific services (CAMEL), IEE colloquium on mobile communications towards the next millennium and beyond", 17th May 1996, XP000605991, that, in a CAMEL network, subscriber-oriented data are stored in a home mobile radio network HPLMN of a subscriber and, when the subscriber moves, are entered in a corresponding subscriber database in accordance with an updating procedure, depending on his current location.

It is the object of the present invention to specify a method and a mobile communication system by means of which it is possible to control the setting-up of a connection also for the utilization of familiar call numbers by the moving subscriber outside his home mobile radio network.

According to the invention, this object is achieved by the features of claim 1 with respect to the method and by the features of claim 9 with respect to the mobile communication system. Developments of the invention are specified in the subclaims.

On the basis of the fact that subscriber-oriented data of each mobile subscriber registered in his home mobile radio network are stored in at least one subscriber database and, when the subscriber moves, are entered in a corresponding subscriber database in accordance with an updating procedure, the subject matter of the invention provides that a subscriber number profile with call numbers generally valid for all registered mobile subscribers is stored additionally in the subscriber database of the home mobile radio network and, when the respective subscriber moves into the visited mobile radio network, is also transmitted in the updating procedure for storage in the corresponding subscriber database. Furthermore, the mobile switching center in the

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visited mobile radio network compares the call numbers of the subscriber number profile with the called party address for a mobile originated call which is initiated with a called party address dialed by the mobile 5 subscriber, and, when they match, a connection is set up to a service control point which translates the called party address also transmitted into a new called party address and sends it back to the mobile switching center for the further setting-up of a connection.

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The subscriber number profile with generally valid call numbers for all mobile subscribers registered in the home network according to the invention has the result that the call numbers familiar 5 to the mobile subscriber can be called up not only in his home network but also in any other network in which he happens to be located, without elaborate additional measures by the subscriber. He behaves as if he were in his home network with respect to the dialing of the 10 desired call numbers. The storage of the subscriber number profile applies to all subscribers so that it does not need to be specified, stored and loaded in the case of an update for each individual subscriber. The subscriber number profile is automatically also 15 supplied in addition to the subscriber-oriented data with each update of the location due to roaming into another network.

According to an advantageous development of the invention, the called party address with the internal 20 network call number format is translated into the new called party address with an international call number format by the service control point. This results in a successful, internationally valid identification of the call number by the service control point in the 25 connection set-up without the subscriber noticing this or even having had to carry out measures for this. This call number which is only valid in the network automatically becomes an international number.

It is also of advantage if the generally valid 30 call numbers in the subscriber number profile are optionally stored either with the complete number of call number digits or with an abbreviated number of call number digits and are in each case compared with the corresponding number of call number digits of the 35 called party address. Storing the abbreviated call numbers offers the advantage of reducing the required storage space in the respective subscriber databases.

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According to another development of the invention, a service key and/or a service control point address of the service control point are stored in the subscriber number profile in addition to the generally valid call numbers and also transmitted. It is thus possible also to supply additional information which leads to a faster and/or simpler connection set-up by the mobile switching center.

The mobile communication system according to the invention exhibits memory means in the subscriber database of the home mobile radio network for additional storage of a subscriber number profile with generally valid call numbers for all registered mobile subscribers and control means in the subscriber database for transmitting the subscriber number profile in the updating procedure when the respective subscriber moves into the visited mobile radio network, and memory means in the corresponding subscriber database for storing the subscriber number profile also transmitted. Furthermore, control means for comparing the call numbers of the subscriber number profile with a called party address dialed by the mobile subscriber for a mobile originated call, which is initiated with the called party address, and for setting up a connection to a service control point when they match, are provided in the mobile switching center of the visited mobile radio network. In addition, the service control point exhibits control means for translating the called party address also transmitted into a new called party address and for sending the new called party address back to the mobile switching center for the further connection set-up.

The invention is explained in greater detail with reference to an exemplary embodiment shown in a drawing which shows the block diagram of a mobile communication system for controlling the setting-up of a connection. The example is based on a system

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according to the GSM Standard but the invention is not restricted to this. From the point of view of a mobile subscriber who uses a mobile station MS for initiating

mobile originated calls and receiving mobile terminated calls, the mobile communication system comprises a home mobile radio network HPLMN and a visited mobile radio network VPLMN. In this arrangement, he is permanently stored with his subscriber-oriented data in a home location register HLR of the home mobile radio network HPLMN for the duration of his registration. Because of his mobility, he is also stored with his subscriber-oriented data in a visitor location register VLR of the visited mobile radio network VPLMN for the duration of a temporary stay in another radio coverage area. The switching in the radio coverage area is handled by a mobile switching center MSC which controls the connection set-up for the calls which can be received and initiated by subscribers or terminals with associated data in the visitor location register VLR. The mobile switching center MSC and the home location register HLR have a control unit CM or, respectively, CON and the home location register HLR and the visitor location register VLR in each case have a memory means MM. The mobile switching center MSC can set up a connection to a service control point SCP of an intelligent network (IN) when an IN trigger is present in the call processing. The service control point SCP has a service logic SL for controlling the IN services.

To control the setting-up of a connection according to the invention, a subscriber number profile R-CSI (roaming CAMEL service information) with generally valid call numbers for all registered mobile subscribers Sub1, Sub2 ... Subn, e.g. No1 = 1234 and No2 = 37367, is additionally stored in the home location register HLR of the home mobile radio network HPLMN in a step (1), and when the respective subscriber moves into the visited mobile radio network VPLMN, also transmitted in the updating procedure LUP (location update) for storage in the visitor location register VLR. Storage in the two subscriber databases in each

case takes place in the memory means MM, the control unit

CON of the home location register HLR initiating the reading-out of the memory means MM and the transmission of the subscriber number profile R-CSI in the updating procedure LUP. In the memory means MM of the home location register HLR, further information is preferably stored such as, e.g., a service key (SK) and/or a service control point address (SCP-A) of the service control point SCP. This additional information, which is defined and administered in a generally valid manner for all subscribers Sub1, Sub2 ... Subn stored in the home location register HLR, can also be transmitted in the updating procedure in addition to the subscriber-oriented data.

The generally valid call numbers Nol, No2 stored in the subscriber number profile R-CSI are, for example, abbreviated call numbers which are familiar to the subscriber in his home mobile radio network HPLMN. Due to the invention, a certain service (service number) can be used or a mailbox can be called up even in the other network VPLMN, even if a different numbering plan exists there, when an abbreviated call number known to the subscriber is dialed. The generally valid call numbers Nol, No2 in the subscriber number profile R-CSI are optionally stored with the complete number of call number digits or with an abbreviated number of call number digits in the memory means MM.

According to the invention, the mobile switching center MSC in the visited mobile radio network VPLMN compares the call numbers Nol, No2 of the subscriber number profile R-CSI with the called party address CldPA for a mobile originated call which is initiated by the mobile subscriber with a message SU (setup) and a dialed called party address CldPA=1234 - for example an abbreviated call number -, according to step (2) in the present example. Since a match between the call number Nol and the called party address CldPA, having in each case the digit combination 1234, exists

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in the present example, this match acts as IN trigger mechanism in the mobile switching center - see step (3) -, so

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that, in consequence, the call is routed from the mobile switching center MSC to the service control point SCP. Routing according to step (4) contains a query message SCP-Q with the called party address 5 CldPA=1234 - or, respectively, the abbreviated call number Nol=1234 - to the service control point SCP, the service logic SL of which translates the received called party address into a new called party address 10 CldPA\*= $+49\ 172\ 66666$  - see step (5). After that, the service control point SCP or, respectively, its service logic SL sends the new called party address 15 CldPA\*= $+49\ 172\ 66666$  back to the mobile switching center MSC for continuing the connection set-up - see step (6). In the present example, the abbreviated call 20 number CldPA=1234 which arrived at the service control point SCP and which only has validity in the home mobile radio network HPLMN with an internal network call number format in this digit combination, was translated into a long call number CldPA\*= $+4917266666$  25 with an international call number format including the country code (+49) and the network code (172) which also has validity in the visited mobile radio network VPLMN.

It is assumed that the subscriber-oriented data 25 for the mobile subscriber also contain service data which provide for the utilization of an IN service and thus the routing of the call to a service point - possibly a different one from the service control points SCP. In this case, these service data are loaded 30 into the visitor location register VLR by the home location register and are evaluated by the mobile switching center MSC. Because of the presence of an IN trigger, the mobile switching center initially sets up the connection to the IN service control point. After 35 this connection has been set up, the call numbers of the subscriber number profile R-CSI are assessed with respect to a match with the called party address CldPA and a further connection is set up according to the

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above procedure to the service control point SCP shown. Sequentializing the call processing ensures that a number of contacts to service control points SCP, or, respectively, service logics SL are supported in  
5 succession

5 during the connection set-up. As a result, it is advantageously possible to combine an IN service which can be individually used and entered for the mobile subscriber with the IN trigger mechanism according to the call numbers of the subscriber number profile which are generally valid for all subscribers according to the invention.